

# Physics

name \_\_\_\_\_ period \_\_\_\_\_

## Inv-7 Expan I: Newton's 1st and 2nd Law: Intro Ques & Probs sheet # \_\_\_\_\_

1.) Show that you understand the connection between the Duck Walk lab and both versions of Newton's 2nd Law (1700's:  $F = \Delta p / t$  Modern Day:  $F = ma$ )

Show the mathematical steps your group took to get from the raw data the Duck Walk Lab to get to Newton's 2nd Law the way HE originally wrote it

Now sketch and label the graph we found relating the force the duck walkers put on the cart compared to the resulting acceleration

How do you go from this graph to our modern day version of Newton's 2nd Law?

2a.) Mr. Richardson uses a broom to apply a force of  $400 \mathbf{i}$  N on Patches backside for a period of 340 ms, how much will Patches momentum change? (Remember,  $\mathbf{i}$  is the unit vector in the positive x direction)

2b.) If Patches (15 kg) was moving at a velocity of  $3.0 \mathbf{i}$  m/s when Mr' Richardson applied his force for 420 ms, what will be the fat cat's velocity just after the force was applied?

3.) Two balls are lifted several feet off the ground and dropped. One has a mass of 20.0 kilograms and the other has a mass of 80.0 kilograms. Use one of your newfound Newton's 2nd Law ( $F = \Delta p / t$  or  $F = ma$ ) to find the gravitational force acting on each ball.

Show work for the 20.0 kg object here:

Show work for the 80.0 kg object here:

4.) Would an object in intergalactic space (between galaxies) still have inertia? yes no

So here is a better question: If an unbalanced force is applied to this intergalactic object, would the object react the same as if it were on earth and the same unbalanced force were applied to it horizontally?

What is the difference between inertial mass and gravitational mass?

5.) A force is put on a 10 kg object that causes the object to increase its speed from from 20 m/s to 50 m/s in 15 seconds. Show your work and units in determining the force on the object.

Required FBD:

6.) Basil pulls with a horizontal force of 20.0 N on a 300 N wagon.

Required FBD:

a.) What acceleration does the wagon undergo (ignore friction)?

b.) Assuming the wagon starts from rest, how far will it move in 2.0 s?

7.) A father in a supermarket pushes a cart loaded with groceries with a total mass of 30.0 kg. He places his 30 N child in the cart and pushes the whole load with a horizontal force of 10.0 N. How far will the cart move in 4.0 s assuming he starts with an initial velocity of 75 cm/s and there is negligible friction.

Required FBD: